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ART. XVII.—*Further Notes on Certain Marine Deposits at Portarlington, Victoria.*

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Introduction.

As the result of criticism of our paper (2) by E. S. Hills (1) we re-visited the sections in September, 1939, and now offer the following remarks thereon.

The Pier Sections.

Our inspection shows that a considerable quantity of recent marine shells has been deposited on the upper part of the cliff face. These shells are clearly due to human agency, having, in all probability, been washed from the surface of the ground above the cliff, by very heavy rains, as we were informed by the Engineer for the Shire of Bellarine, who stated that shells are carried from the beach for use on footpaths. If these were the shells seen by Hills, then he was justified in regarding them as artificially laid over the ferruginous sands.

We desire to emphasize the fact that the shells referred to have been deposited in their present positions since our visits on which our paper was based. At that time there were thin horizontal bands of recent marine shells in the dark-coloured surface sands and in the outcrops of the brown sands some feet below. These bands were only found after close search and, as a result of their mode of occurrence and distribution, we came to the conclusion, after considering the possibility of their occurrence being due to human agency, that they were of the same age as the brown sands.

Recent gullying action shows that the upper dark-coloured sandy beds, containing an abundance of recent marine shells hitherto covered by "wash", have been artificially laid down and that, in addition to the shells, a considerable quantity of the brown sand has been carried farther down the cliff face. In some of these brown sand outcrops, there are thin horizontal shell bands; but most of the shell-bearing brown sand outcrops to which our earlier paper referred have been removed by rain action since that paper was written, so that a re-consideration of the evidence submitted by us is not altogether possible. As a result, however, of our recent investigation, we have come to the conclusion that the shell bands seen by us were the indirect

result of human interference, and our first paper is modified accordingly. Consequently, the age of the brown sands, so far as based on contained fossils, must be left an open question. We would point out, however, that their location and lithology suggest that they are of the same age as the ferruginous beds of Steele's Rock section, whatever that may be.

The Steele's Rock Section.

The criticism of this section offered by Hills was anticipated and answered in our first paper, so that a reply to that criticism seems hardly necessary. We may, however, point out that our re-examination of the section has served to confirm our original conclusion, viz., that the ferruginous beds merge into the calcareous beds, the two being merely phases of the one series. Hills does not discuss the western portion of the section, where the evidence of the unity of the beds is strongest, as we pointed out in our first paper. He rests his disagreement with our interpretation on the relations of the rocks at the eastern end of the section, where he considers that the horizontal calcareous beds rest unconformably on the inclined and current-bedded ferruginous ones. Close examination, however, shows that the planes of stratification of the ferruginous beds can be traced faintly into the calcareous beds, the faintness being due to the fact that the stratification planes have been almost completely obliterated by the approximately horizontal division lines of the subsequently introduced carbonate of lime. In addition, there are, in the calcareous rocks small irregular unaltered patches of the ferruginous beds.

The part of the section just referred to is on the western side of the small headland which lies immediately to the south of Steele's Rock. If the calcareous band be followed round the headland to the eastern side of the latter, it can be seen to die out as an inclined lenticular patch in the yellow earthy limestone which rests conformably upon the ferruginous beds (fig. 1). This lenticle we regard as originally part of the limestone, and

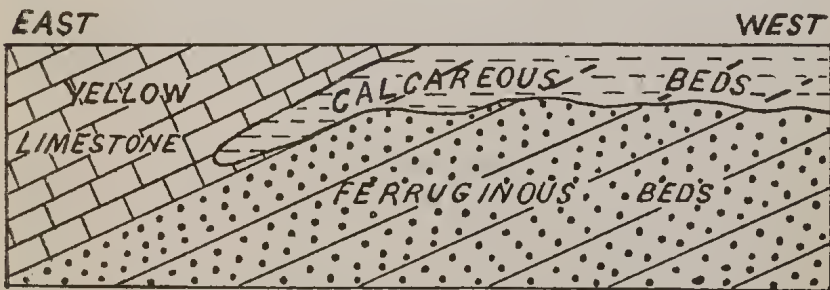


FIG. 1.—Diagrammatic section of the cliffs opposite Steele's Rock, Portarlinton. The planes of stratification of the ferruginous beds pass faintly into the calcareous beds.

not as filling a cavity in the latter. There are therefore two sets only of distinct sedimentary beds in the section—the ferruginous sands and the yellow limestone. The calcareous rocks are common to both, but in a very limited degree to the limestone, and are merely an alteration phase of each.

In the calcareous beds, a few feet west of the lenticular patch just noted, we found on our re-examination two Recent marine shells, this being the first discovery of fossils in the extreme eastern end of the section.

The basal beds in the western portion of the Steele's Rock section as a whole, follow the very irregular surface of the Older Basalt, but above, the stratification, although indistinct, approximates in both the brown sands and the calcareous beds towards the horizontal. Deposition, however, was evidently rapid, as shown by the irregular pockets of shells. Even if the horizontality is only apparent and represents the strike of the beds, that does not affect their conformity.

Conclusions.

The want of undoubted fossil evidence as to the age of the Pier beds does not affect the conclusions we have drawn as to the age and significance of the Steele's Rock deposits. Neither does it affect our inferences as to the age of the upper ferruginous non-fossiliferous beds of the Bellarine and Mornington Peninsulas, and of the district to the east, north, and north-east of Melbourne; nor our proposed subdivision of the post-Tertiary rocks of the Port Phillip Bay district, since we regard the evidence of the Steele's Rock section as sufficient independently to support those ideas.

As a final remark, we desire to correct a misinterpretation of our paper by Hills. He states (p. 132) that we argue that the "Red Beds" of the Melbourne district are Pleistocene and not Barwonian and Kalimnan as formerly believed. Our references in every instance were to the uppermost non-fossiliferous beds, which all authorities have hitherto placed in the Upper Tertiary (pp. 319 et seq.). The Kalimnan age of some of the deposits was challenged by us, but we made no criticism of the Barwonian. That was outside the scope of the paper.

References.

1. HILLS, E. S.—The Age and Physiographic Relationships of the Cainozoic Volcanic Rocks of Victoria. *Proc. Roy. Soc. Vic.*, n.s., li. (1), pp. 112-139, 1939.
2. JUTSON, J. T., and ALAN COULSON.—On the Age of Certain Marine Deposits at Portarlington, Victoria, with a Proposed Subdivision of the Post-Tertiary Rocks of the Port Phillip Bay District. *Proc. Roy. Soc. Vic.*, n.s., xlix. (2), pp. 314-326, 1937.